

Environmental Product Declaration

Pantograph Disconnecter type TFB range 123 - 550 kV.



ABB Zvar S.A.



Organisational framework

Manufacturer:

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ABB Zwar S.A. belongs to the *Business HV Disconnectors* as a part of the Business Area, BA High Voltage Technology “PTHV”, and consists of five main manufacturing sites:

PLZWA - Poland Łódź
RUELE - Russia Ekaterinburg
AUTIL - Australia Sydney
INTAD - India Maneja Baroda
EGHVO - Egypt Cairo

The products consist of high voltage disconnectors for use in electrical AC and DC transmission systems for voltages above 44 kV.

Environmental management:

Process of environmental management system (EMS) implementation according to international standard ISO 14001 have been started four years ago. A Polish Disconnectors Division in the middle of 1997 received the certificate as first one in the BU.

Implementation status	PLZWA	Implemented
	RUELE	Will be completed 2002
	AUTIL	Implemented
	INTAD	Implemented
	EGHVO	Will be completed 2002

Product description:

Disconnectors are mechanical switch devices, which in the open position provide an insulating distance. They are able to open or close a circuit if either a negligible current is switched or if no significant change occurs in the voltage between the terminals of the poles.

The ABB range of disconnectors cover all common switching station arrangements for 44 to 800 kV; 800A to 4000A and 100 to 160 kA (I_p, peak short – circuit current).

Product range

Type Pantograph Disconnecter
Voltage 123 kV ÷ 550 kV
Op. Mechanism Motor or Manual
Current 3150 A ÷ 4000 A
I_p 100 kA / 160 kA
Earth Switch one for pole

Type	TFB ... pc 3150 A	TFB ... q 4000 A
	I _p	I _p
123 kV	125 kA	125 kA
145 kV	125 kA	125 kA
170 kV	160 kA	160 kA
245 kV	160 kA	160 kA
300 kV	160 kA	160 kA
420 kV	160 kA	160 kA
550 kV	125 kA	125 kA
Associated built-in Earthling Switch (123-170) kV –TEC; (245-550) kV – TEB		

Environmental performance

The data and calculation are in accordance with Product Specific Requirements (PSR 2000:4) for Medium/High-Voltage Disconnectors, dated September 2000, which applying rules included in ISO 14040÷43, specifies the following baselines for the LCA calculation.

Functional unit

has been set to: a device that can serve as a disconnector in a three pole power transmission system, equipped in one earthing switch and two motor drives each, operational for 20 years, at current 3150 A and voltage 420 kV when in the closed position, in all kind of climate without polar climate.

System boundaries

The life cycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly of the device, transportation and use of the product and dismantling after end of life. It includes consumption of material and energy resources as well as emissions and waste generation. Calculations are based upon an estimated lifetime of 20 years and average load assumed as 50% of nominal current. Polish mix of energy has been used for calculating energy consumption during manufacturing and a European mix of energy for calculating energy losses during use and energy for disposal. The TFB 420 have been chosen for the Life Cycle Assessment study, for device below or above these limits the environmental impact may be interpolated.

No energy consumed by drives during lifetime has been taken into account due to the fact that is less than 3% total disconnectors energy consumption

The table below lists the materials used and their quantities:

Summary of materials	kg / device	
	TFB 420	
Aluminium profile	574,29	kg
Cooper profile	136,78	kg
Steel profile/sheet	828,14	kg
Cast iron	107,71	kg
Stainless steel	72,85	kg
Silver	1,08	kg
Porcelain	1500,00	kg
Plastic	22,21	kg
Wood (packaging)	210,00	kg
Others	66,11	kg

Allocation unit

The factor for allocation of common environmental aspects during manufacturing is calculated as the ratio of the functional unit to the sum of all functional units produced annually in the relevant part of the production unit.

Resource utilisation

Inventory	Use of non-renewable resources		Manufacturing phase	
			TFB 420	Use phase TFB 420
* Ag	(material, resource)	kg	1,14	2,16
* Al	(material, resource)	kg	424,74	0,00
* Coal	(energy, resource)	kg	2720,86	44647,72
* S	(material, resource)	kg	9,04	0,00
* Fe	(material, resource)	kg	1039,32	0,00
* Cr	(material, resource)	kg	15,69	0,00
* Gas	(energy, resource)	m3	1369,75	0,00
* Cu	(material, resource)	kg	138,00	11,81
* Gas	(energy, resource)	kg	191,46	3090,73
* Oil	(energy, resource)	kg	627,74	4767,65
* Ni	(material, resource)	kg	6,74	0,00
* U	(energy, resource)	kg	0,02	0,00
* Zn	(material, resource)	kg	4,71	0,00
* Mn	(material resource)	kg	2,96	0,00
Use of renewable resources			TFB 420	TFB 420
* Wood	(material, resource)	kg	210,00	0,00
* Water		m3	3,51	0,00
* Hydro power		MJ	219,55	0,00

Energy consumption and losses	kWh	
	Manufacturing phase TFB 420	Use phase TFB 420
Electrical energy	2768,98	162977,06
Heat energy	1402,00	0,00

The average Polish electricity mix is defined as being 2,9% hydro, 36,3% lignite and 60,8% stone coal. The average European electrical energy is defined as being 10% gas, 15% hydro, 36% nuclear, 10% oil, 19% stone coal and 10% lignite coal. The resultant resource utilisation is shown in the table above

Waste	kg / device	
Hazardous waste	TFB 420	
After production	11,36	kg
After usage	0,00	kg
After end of life	0,000	kg
Regular waste (to landfill)	TFB 420	
After production	677,11	kg
After usage	0,18	kg
At final disposal total waste	3222,83	kg
At final disposal waste to recycling	1704,25	kg

The classification data for emissions are as below

Category of impact	Equivalent unit per device	Manufacturing TFB 420	Usage phase TFB 420	Total life cycle TFB 420
Global warming GWP (100 years)	kg CO ₂	12756,51	82500,47	95256,98
Acidification	mol H ⁺	1540,51	16204,48	17744,99
Ozone depletion ODP (20 years)	kg CFC-11	0,00	0,00	0,00
Photochemical oxidants POCP	kg ethylene	1,85	18,86	20,71
Eutrophication	kg O ₂	149,51	1047,16	1196,67

The values are based upon the indexes specified in Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 1999-11-25 by the Swedish Environmental Management Council

Additional qualifying factors

Recycling and disposal

The disconnectors consist of large metals parts (aluminium, copper, steel) relatively easy to dismantling and recycling

The description of decommissioning can be found in the:

- Service instruction GPDT 029652
- Sales manual (on CD)
- LCA report
- See references.

Usage phase in relation to the total

It is to be observed that for the disconnector type TFB 420 the environmental impact during the usage phase is the most important.

Category of impact for TFB 420	Use phase in % of total impact
Global warming GWP	87
Acidification	91
Photochemical oxidants	91
Eutrophication	88

Third party certification

This EPD has been reviewed and found to comply with the Product Specific Requirement, PSR 2000:4 for, Medium/High-Voltage Disconnectors, dated September 2000 with the Swedish Environmental Councils (requirements for environmental product declarations dated 25 November 1999.

References

- LCA report TR 01-008
- PSR for Disconnectors (PSR 2000:4)
- Service instructions (includes de-commissioning instruction)
- Sales manual (on CD)
- Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 2000-03-27 by the Swedish Environmental Management Council

The above mentioned documents are available upon request

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